

WHAT IS CLAIMED IS:

1. A mobile communication system comprising a plurality of relay routers, a plurality of access routers, and a server apparatus,

5 the mobile communication system being constructed in a configuration wherein a router existing on paths for delivery of data from a correspondent terminal to a mobile terminal via each of access routers used in a multipath handover state by the mobile terminal, multicasts the data,

10 wherein the server apparatus performs such a control as to dynamically switch one router to multicast the data, to another in conjunction with movement of the mobile terminal or the correspondent terminal.

2. The mobile communication system according to  
15 Claim 1, wherein the server apparatus comprises:

acquiring means for acquiring from each access router, path information between a router connected to the correspondent terminal and each of the access routers used in the multipath handover state by the mobile terminal;

20 selecting means for making a comparison of the path information acquired by the acquiring means and selecting a router to multicast the data, based on a result of the comparison; and

25 instructing means for instructing the router selected by the selecting means, to multicast the data.

3. The mobile communication system according to

Claim 1, wherein a router connected to the correspondent terminal transmits path information to each of the access routers used in the multipath handover state by the mobile terminal, and

5            wherein each path information is routed through a shortest path from said router as a start point to each of the access routers as an end point, a router passed by each path information records identification information of said router in each path information, and each of the access routers  
10          refers to the path information received, so as to acquire routers on the shortest path from the start point to the end point, and a passing order thereof on the shortest path.

4.        The mobile communication system according to Claim 2, wherein the selecting means of the server apparatus  
15          is configured to:

          make sequential comparisons of the path information acquired by the acquiring means, hop by hop from a start point;

          if about a hop as a target for the comparisons, routers  
20          passed in all the paths are identical, perform a comparison about a next hop;

          select as a router to multicast the data, a router in one hop before a path against which there exists no other path passing an identical router; and

25          thereafter eliminate said path, then repeat the comparison and selecting processes before there remains one

or less path as a comparison target or before a comparison is completed for a hop of an end point, and thereby select another router to multicast the data.

5        5.     The mobile communication system according to Claim 2, wherein the instructing means of the server apparatus is configured to:

        instruct the router newly selected by the selecting means, to start multicasting the data; and

        instruct a router removed from the router to multicast  
10     the data, in conjunction with the selection of the router, to cancel multicast of the data.

        6.     The mobile communication system according to Claim 2, wherein at an opportunity of a change in the access routers used in the multipath handover state by the mobile  
15     terminal, the server apparatus sequentially executes the acquiring process, the selecting process, and the instructing process.

        7.     The mobile communication system according to Claim 3, wherein one of the access routers used in the multipath  
20     handover state by the mobile terminal sends a path information request to the correspondent terminal under communication with the mobile terminal, and

        wherein the router connected to the correspondent terminal terminates the path information request and at this  
25     opportunity, said router sends path information to each of the access routers used in the multipath handover state by

the mobile terminal.

8. The mobile communication system according to Claim 7, wherein each access router receiving the path information records identification information of the access router itself in the path information and sends the path information to the server apparatus.

9. The mobile communication system according to Claim 5, wherein said router newly selected by the selecting means receives a multicast start request from the server apparatus, retains information included in the multicast start request, and multicasts data addressed to the mobile terminal, and

wherein the router removed from the router to multicast the data, in conjunction with the selection of the router receives a multicast stop request from the server apparatus and stops multicasting the data.

10. The mobile communication system according to Claim 9, wherein, when receiving the data addressed to the mobile terminal, the router newly selected by the selecting means makes copies of the data by the number of routers as multicast destinations and transmits the data copies to the respective multicast destinations.

11. The mobile communication system according to Claim 7, wherein said path information request contains identification information of a sender and a recipient of the path information request and also contains identification

information of the mobile terminal and identification information of the access routers to be designated as destinations of the path information.

12. The mobile communication system according to  
5 Claim 7, wherein the path information contains identification information of a sender and a recipient of the path information and also contains identification information of the mobile terminal, identification information of the correspondent terminal, and identification information of the router as  
10 a start point of a path indicated by the path information.

13. The mobile communication system according to Claim 9, wherein the multicast start request contains identification information of a sender and a recipient of the multicast start request and also contains identification  
15 information of the mobile terminal and identification information of routers as multicast destinations, and

wherein the multicast stop request contains identification information of a sender and a recipient of the multicast stop request and also contains identification  
20 information of the mobile terminal.

14. A server apparatus connected to a plurality of relay routers and to a plurality of access routers, the server apparatus being configured to instruct a router existing on paths for delivery of data from a correspondent terminal  
25 to a mobile terminal via each of access routers used in a multipath handover state by the mobile terminal, to multicast

the data,

said server apparatus comprising:

acquiring means for acquiring from each access router,  
path information between a router connected to the  
5 correspondent terminal and each of the access routers used  
in the multipath handover state by the mobile terminal, in  
conjunction with movement of the mobile terminal or the  
correspondent terminal;

selecting means for making a comparison of the path  
10 information acquired by the acquiring means and selecting  
a router to multicast the data, based on a result of the  
comparison; and

instructing means for instructing the router selected  
by the selecting means, to multicast the data.

15 15. A data transmission method in a mobile  
communication system comprising a plurality of relay routers,  
a plurality of access routers, and a server apparatus,  
the mobile communication system being constructed in  
a configuration wherein a router existing on paths for  
20 delivery of data from a correspondent terminal to a mobile  
terminal via each of access routers used in a multipath  
handover state by the mobile terminal, multicasts the data,  
said data transmission method comprising:

a control step wherein the server apparatus dynamically  
25 switches one router to multicast the data, to another in  
conjunction with movement of the mobile terminal or the

correspondent terminal.

16. The mobile communication system according to Claim 1, wherein the server apparatus comprises:

5        acquiring means for acquiring path information between  
a router connected to the correspondent terminal and each  
of the access routers used in the multipath handover state  
by the mobile terminal, based on information in a link state  
database of OSPF, which was acquired from the router or the  
access router;

10        selecting means for making a comparison of the path  
information acquired by the acquiring means and selecting  
a router to multicast the data, based on a result of the  
comparison; and

15        instructing means for instructing the router selected  
by the selecting means, to multicast the data.

17. The mobile communication system according to Claim 1, wherein acquiring means of the server apparatus is configured to:

20        acquire from at least one router belonging to each  
management area of OSPF used by a network, information in  
a link state database made in the management area to which  
said router belongs;

25        change all cost values between routers or access  
routers, recorded in the link state database, to an identical  
numeral larger than 0 according to need;

receive from a router connected to the correspondent

terminal, a start point search response indicating that said router is a start point of path information;

activate a shortest path algorithm with the router indicated by the start point search response, as a start point, and thereby generate a shortest hop tree with said router at a start point; and

refer to the shortest hop tree to acquire as path information, routers on a shortest path from the router as a start point to each access router as an end point, and a passing order thereof.

18. The mobile communication system according to Claim 17, wherein one of the access routers used in the multipath handover state by the mobile terminal sends a start point search request to the correspondent terminal as a correspondent under communication with the mobile terminal, and

wherein the router connected to the correspondent terminal terminates the start point search request thereat and at this opportunity, said router sends the start point search response in which identification information of the router is recorded, to the server apparatus.

19. The mobile communication system according to Claim 18, wherein the start point search request contains identification information of a sender and a recipient of the start point search request and also contains identification information of the mobile terminal.



20. The mobile communication system according to Claim 17, wherein the start point search response contains identification information of a sender and a recipient of the start point search response and also contains  
5 identification information of the mobile terminal, identification information of the correspondent terminal, and identification information of a router as a start point obtained by a search.

21. A server apparatus connected to a plurality of relay routers and to a plurality of access routers, the server  
10 apparatus being configured to instruct a router existing on paths for delivery of data from a correspondent terminal to a mobile terminal via each of access routers used in a multipath handover state by the mobile terminal, to multicast  
15 the data,

said server apparatus comprising:

acquiring means for acquiring path information between  
a router connected to the correspondent terminal and each  
of the access routers used in the multipath handover state  
20 by the mobile terminal, based on information in a link state database of OSPF, which was acquired from the router or the access router, in conjunction with movement of the mobile terminal or the correspondent terminal;

selecting means for making a comparison of the path  
25 information acquired by the acquiring means and selecting a router to multicast the data, based on a result of the

comparison; and

instructing means for instructing the router selected  
by the selecting means, to multicast the data.